

REMARKS/ARGUMENTS

The courteous interview granted by Examiner Caine to applicants' undersigned attorney and first named inventor Dr. Tie Lan, on May 7, 2003, is hereby acknowledged with appreciation. At the interview, the invention, the outstanding Office Action and the prior art of record were thoroughly discussed. The claims have been amended to overcome the rejections and objections under 35 U.S.C. §112.

At the interview, the distinguishing features of the claimed invention were brought out in detail to distinguish over the prior art Pinnavia (U.S. 5,834,391) and Barbee (U.S. 6,384,121) patents. As explained, the common practice of intercalating organic cations between platelets of a layered clay material is to add the organic cations in an amount in substantial excess of the amount approximated by the cation exchange capacity to assure complete cation exchange. The approximate cation exchange capacity, as determined by a methylene blue (indicator) titration method, or otherwise, is an approximation, and is usually expressed in a range that varies at least 10%. In order to assure complete ion exchange, the amount of organic cations added to the layered clay material for ion-exchange with the layered clay material is an amount of double the molar amount dictated by the stated (or experimentally determined by titration) ion exchange capacity of the layered clay material (*see* Pinnavia, col. 5, lines 22,23) or up to three times preferably 1-1.5 times the amount (*see* Barbee, col. 12, lines 31-34).

As explained in applicants' specification in the paragraph at the top of page 6, applicants have discovered significant problems that result from adding a substantial excess of organic cation to the layered clay material.

"In accordance with the invention herein, it has been found that the excess salts of the organic cations that often remain in the intercalated layered clay materials taught by the prior art are thermally unstable at the temperature of the molten matrix polymers used to form the nanocomposites of the present invention. Without being bound by any particular theory, it is believed that the thermal decomposition of the excess salts of the organic cations may lead to the formation of volatile organic compounds and/or acids (including hydrohalic acids such as HCl). If even relatively small excess quantities of extractible materials, including the salts of the organic cation salts, remain in

contact with the intercalated layered clay material, and are incorporated into the nanocomposites, volatilization and/or thermal degradation reactions can lead to degradation of the molecular weight of the matrix polymer, the formation of gases and/or voids and/or discoloration. The voids and/or discoloration can severely reduce the gas barrier properties, transparency, and haze of the resulting nanocomposite, and any articles derived therefrom. Thus, it is desirable to provide nanocomposite materials that are substantially free from extractable materials such as extractable salts of organic cations."

The prior art, *e.g.*, Barbee at col. 12, lines 34-37, suggest that **most of the** excess organic cation salt(s) simply can be removed by washing. Thus, even the prior art acknowledges that not all of the excess salts can be removed when a substantial excess of organic cations is initially added to the layered clay material for ion-exchange. Applicants have confirmed this at page 27, lines 11-14, stating that washing is only partially effective to remove the extractable salts.

Applicants' claimed invention is directed to **initially** providing the proper stoichiometric amount of organic cations to the clay to provide for complete, or nearly complete, reaction with the organic cations, without leaving an excess, or much of an excess, of organic cations in the layered clay material.

While it could be argued that Barbee et al. might get lucky, and somewhere within the preferred disclosed range of 1 to 1.5 moles of organic cation per mole of exchangeable cations, Barbee could, once in a while, provide excess organic cations of less than 5 weight percent (claim 1), or less than .05 excess moles of organic cations. However, the law is clear that if the claimed invention might only be met by the reference by a remote chance, there is no anticipation. The fact that a certain characteristic may be present in a prior art reference is not sufficient to establish inherency of that characteristic. In *re* Rijckaert, 28 U.S.P.Q. 2d 1955, 1957 (Fed. Cir. 1993). Further, applicants are the first to discover the problems resulting from excess organic cations, and have solved these problems with the claimed invention. This is strong evidence of the non-obviousness of the claimed invention (*Eibl Process* 261 U.S. 45, 1.923).

With reference to the product claims 1-12, these claims have been amended to state that they are prepared without washing away excess organic cations - which has always

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been required in the prior art. As explained at the interview, washing the intercalate causes alignment of the ion-exchanged organic cations intercalated between clay platelets resulting in a distinct difference between the product claimed herein and any intercalate made by a process that requires washing away excess cations. Accordingly, it is submitted that all product claims clearly distinguish from the prior art of record.

It is submitted, that the rejections should be withdrawn. Early and favorable consideration therefore, is respectfully requested. .

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Respectfully submitted,

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